MTS FSE MODULAR TRAINING

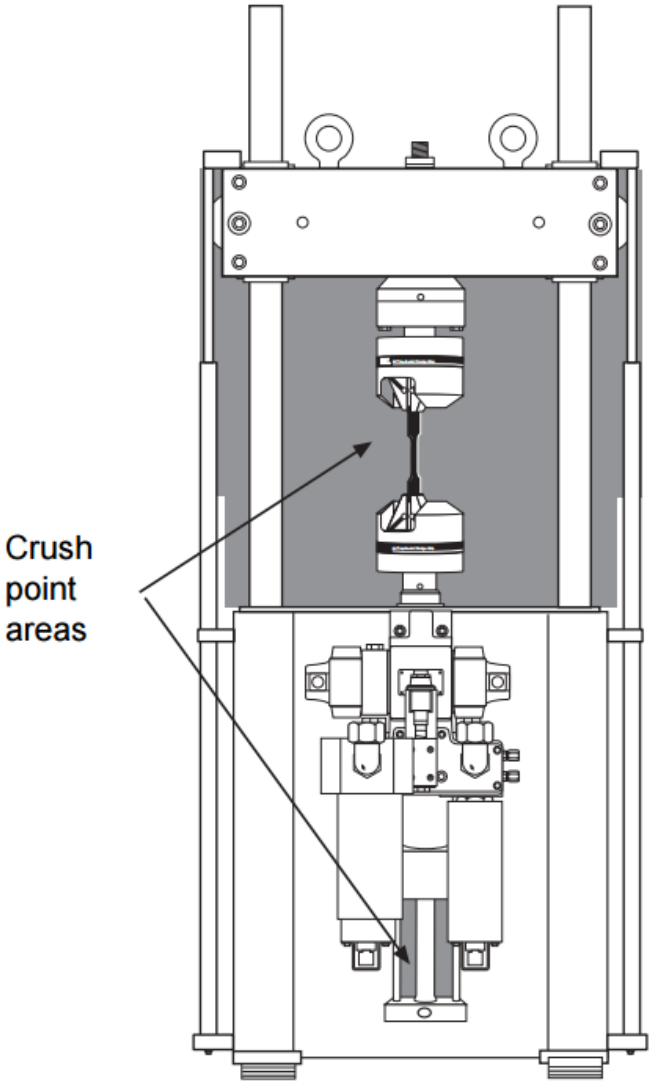
312 and 318 Load Frames

September 11, 2015 Rev A

be certain.

Load Frame Safety – Crush Zones

- Be aware of the crush zones on any load frame while working on the system. Keep clear of the crush zones. Some of the potential crush zones are:
- In the test space area between the platen and crosshead. A sudden unexpected movement of the actuator can be extremely high velocity.
- Under the grip when the actuator is extended and the hydraulics are off. The actuator can fall due to gravity.
- Below the actuator where the exposed piston rod is located.



312 Load Frames

- The first regular production load frame was the MTS Model 312.
- This was a grey color load frame.
- This used many standard production components.
- These items were assembled to create a load frame.

312 Load Frames - Actuator

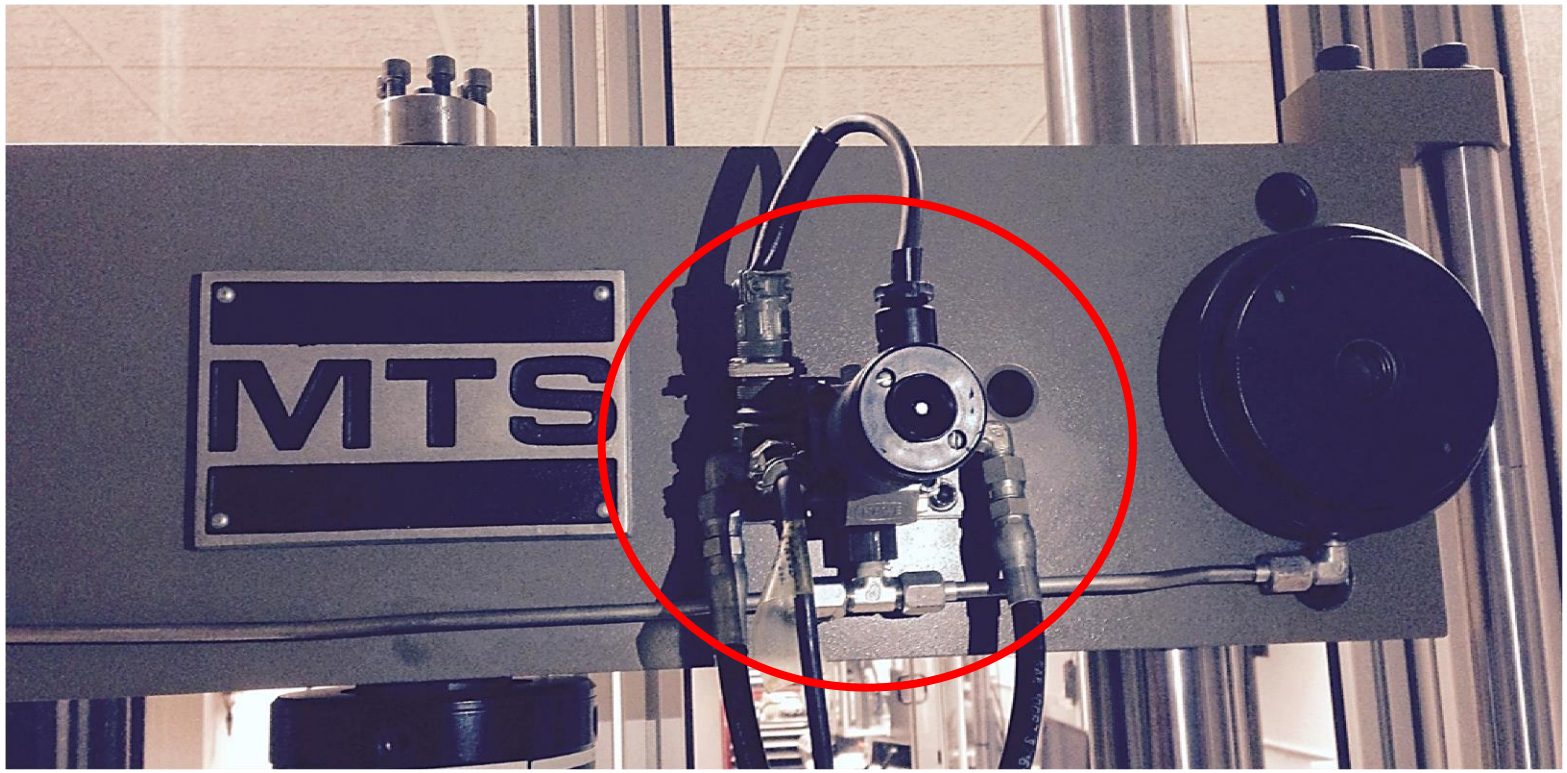
- The 312 load frames had a MTS model 204 series actuator installed. These actuators were complete with both end caps installed on the actuator. The actuator was mounted to the bottom of the platen with mounting bolts.

312 Load Frames - HSM

- The 312 load frame typically had a MTS model 294 HSM attached to the actuator.
- This manifold has a built in filter.
- Pressure and return accumulators were standard.
- This manifold also had optional off/low/high pressure control.

312 Load Frame – Hydraulic Locks

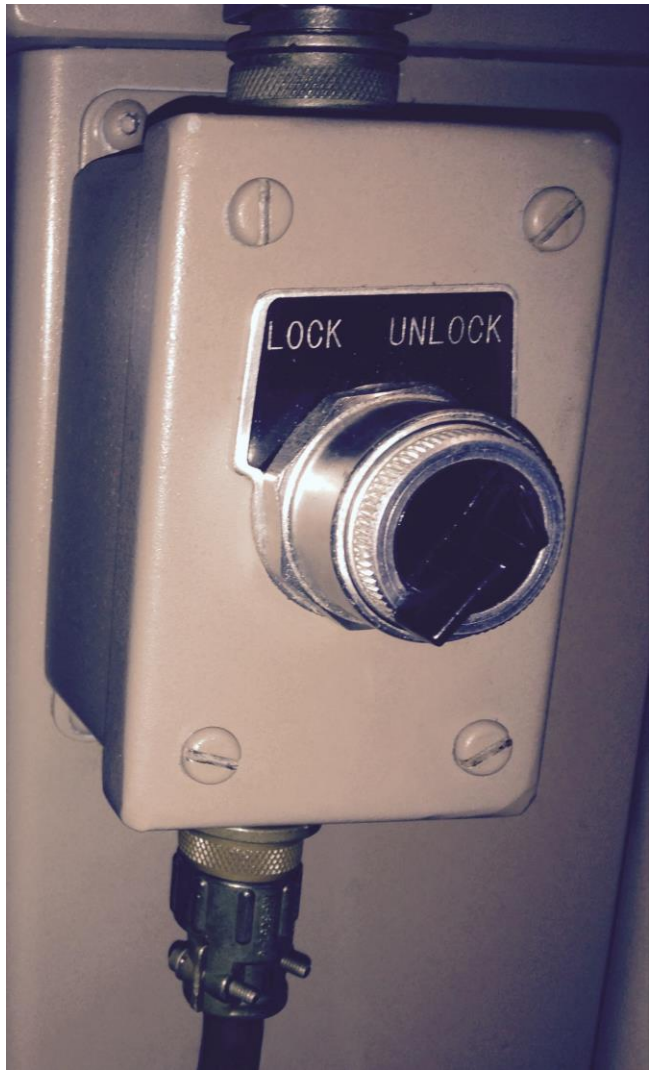
» The crosshead lock is controlled by a solenoid.



312 Load Frame – Hydraulic Locks

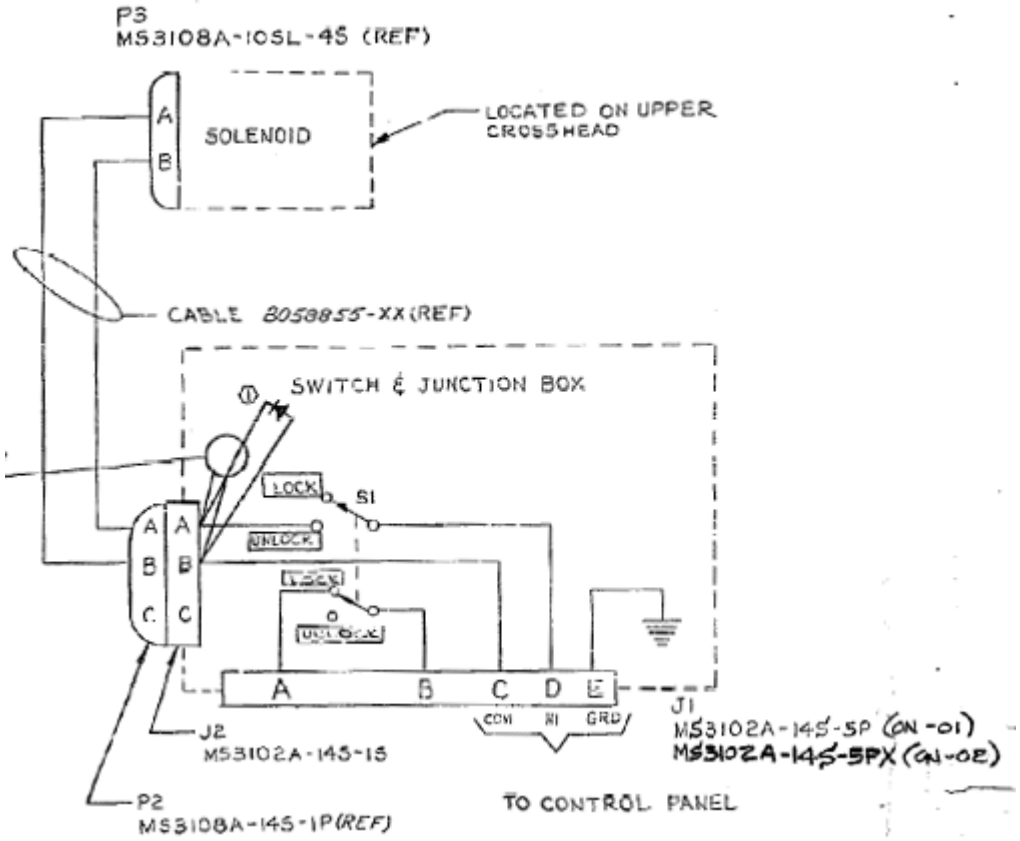
- An electrical switch activates the solenoid to apply and release pressure to the hydraulic lock cylinders.

- Default controller configuration is to generate a program interlock when the crosshead is unlocked.
  - This stops the program that is running and leaves hydraulics on



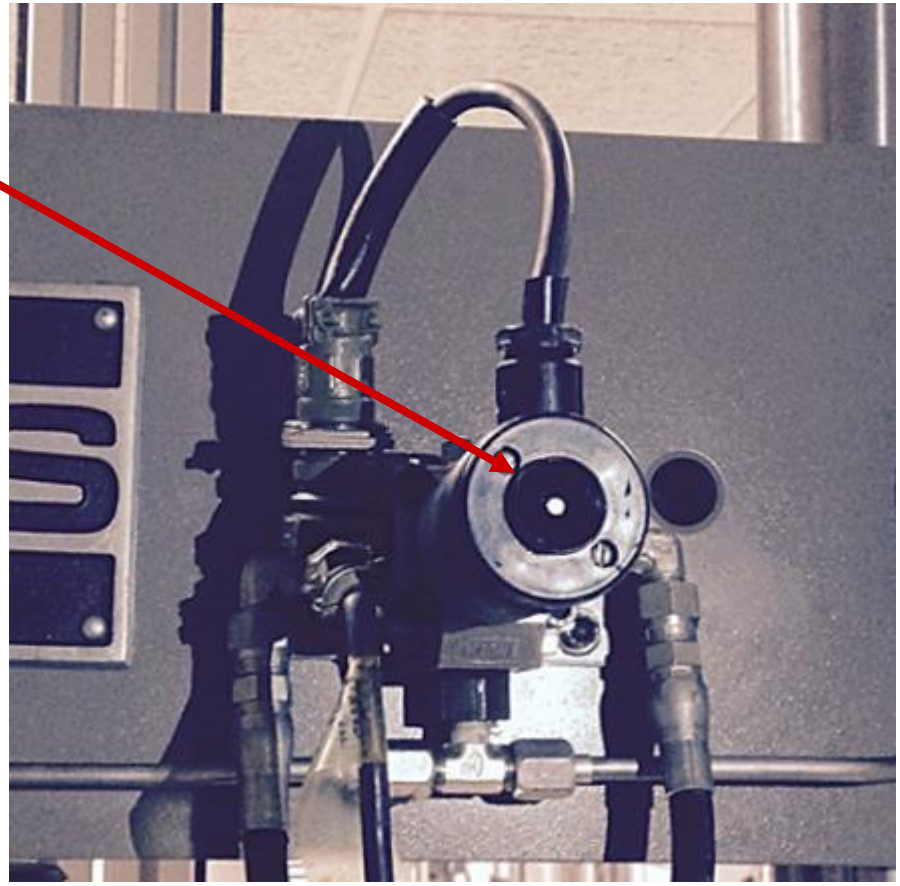
312 Load Frame – Hydraulic Locks

- Power is applied to unlock the hydraulic lock cylinders.
- Voltage is only available when hydraulics are in high pressure.
- A contact in the switch is used to sense when the crosshead is unlocked. This senses power to the lock solenoid and does not detect the actual locked or unlocked condition of the crosshead.
  - Modern load frames use a pressure switch to detect the actual lock / unlock condition



312 Load Frame – Hydraulic Locks

- The solenoid can be manually activated by pressing the manual actuation button under the rubber cover at the rear of the solenoid. This is spring loaded and will return to the unactuated position when releasing.
- This can be used during troubleshooting to isolate an issue with the lock circuit.
- Pressing the manual actuation button on the solenoid unlocks the hydraulic lock cylinders.



312 Load Frame – Hydraulic Lifts

- The hydraulic lifts are controlled by a pair of hydraulic valves. There is both an up and down valve.
- These valves should not be open while the crosshead is locked.
- The crosshead is lowered by gravity. The down valve opens the lift cylinders to the drain line.

318 Load Frames

- The next generation of load frames was the 318. This load frame was designed using integrated components.
- The first version of this load frame (A version) was brown in color. The second version (B version) was gray / white in color.

318A ***318B***

1984 *1994*

318 Load Frame – Model Specifications

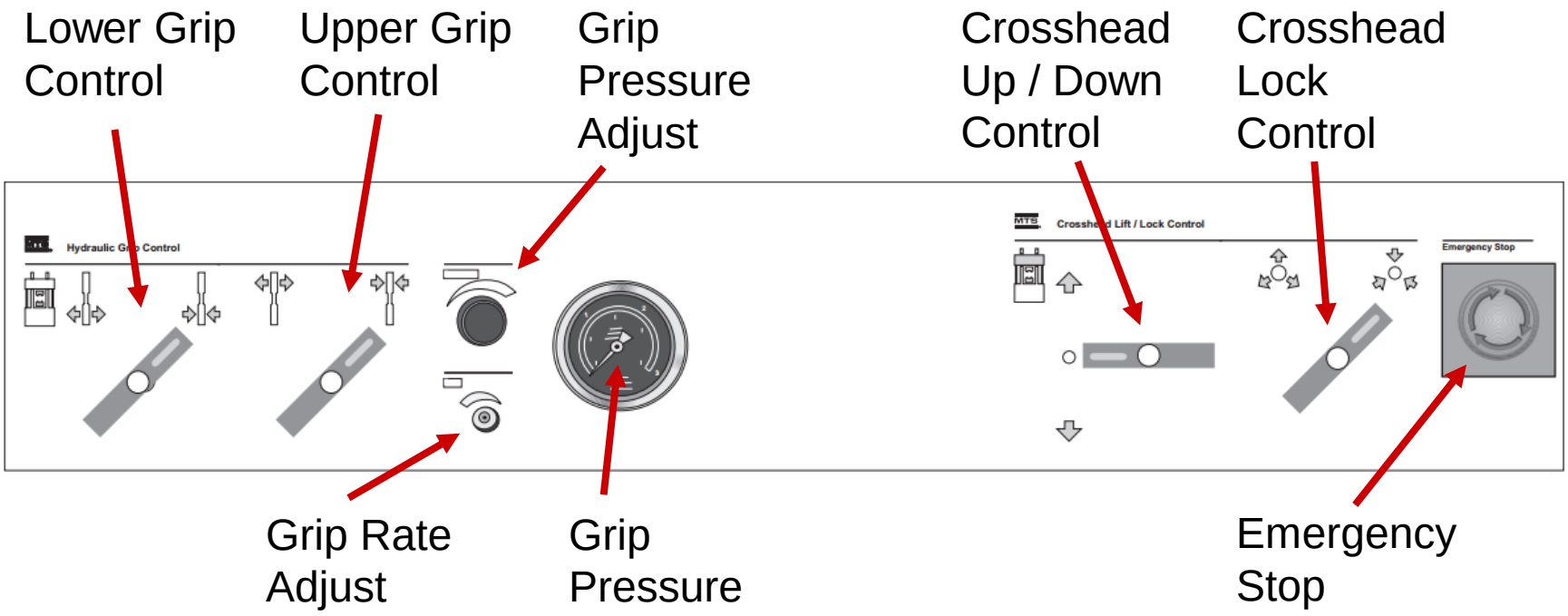
Force Ratings

The Series 318 Load Units include other products. The following table lists specifications from several product information manuals. Specifications listed in the respective product information manual supersede the following specifications.

Model	Frame Fatigue Rating	Actuator Rating*	Transducer Rating†	Mounting Threads
318.10	100 kN (22 kip)	25 kN (5.5 kip)	25 kN (5.5 kip)	M27 x 2 (1 - 14 UNS)
		50 kN (11 kip)	50 kN (11 kip)	M27 x 2 (1 - 14 UNS)
		100 kN (22 kip)	100 kN (22 kip)	M27 x 2 (1 - 14 UNS)
318.25	250 kN (55 kip)	100 kN (22 kip)	100 kN (22 kip)	M27 x 2 (1 - 14 UNS)
		250 kN (55 kip)	250 kN (55 kip)	M36 x 2 (1 1/2 - 12 UNF)
318.50	500 kN (110 kip)	250 kN (55 kip)	250 kN (55 kip)	M36 x 2 (1 1/2 - 12 UNF)
		500 kN (110 kip)	500 kN (110 kip)	M52 x 2 (2 -12 UNF)

318 Load Frame - Controls

» There are several versions of the load frame controls depending on the age of the load frame and the options purchased. Not all load frames have all options. Below is an example of a typical control panel on a 318 load frame.



318 Load Frames - Design

- This load frame used a 244 actuator however this actuator was not the same as a model 244 structural actuator. The 318 load frame incorporated an integral end cap. The actuator upper end cap was part of the load frame table / platen.

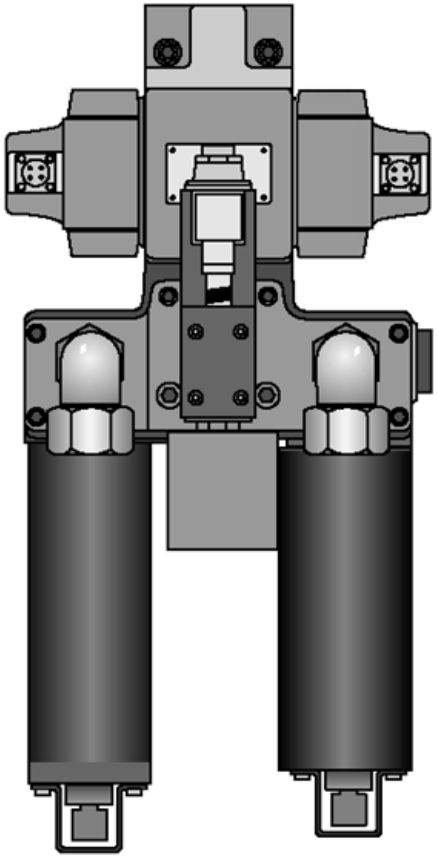
- The design change was made to make the load frame stiffer.
  - The shorter the load train, the less susceptible the frame is to bending.

- This makes removal of the actuator for service different than a 312 load frame. On the 312 load frame the 204 series actuator is removed as a complete assembly.

- On the 318 load frame the 244 actuator comes out in pieces.

318 Load Frame - HSM

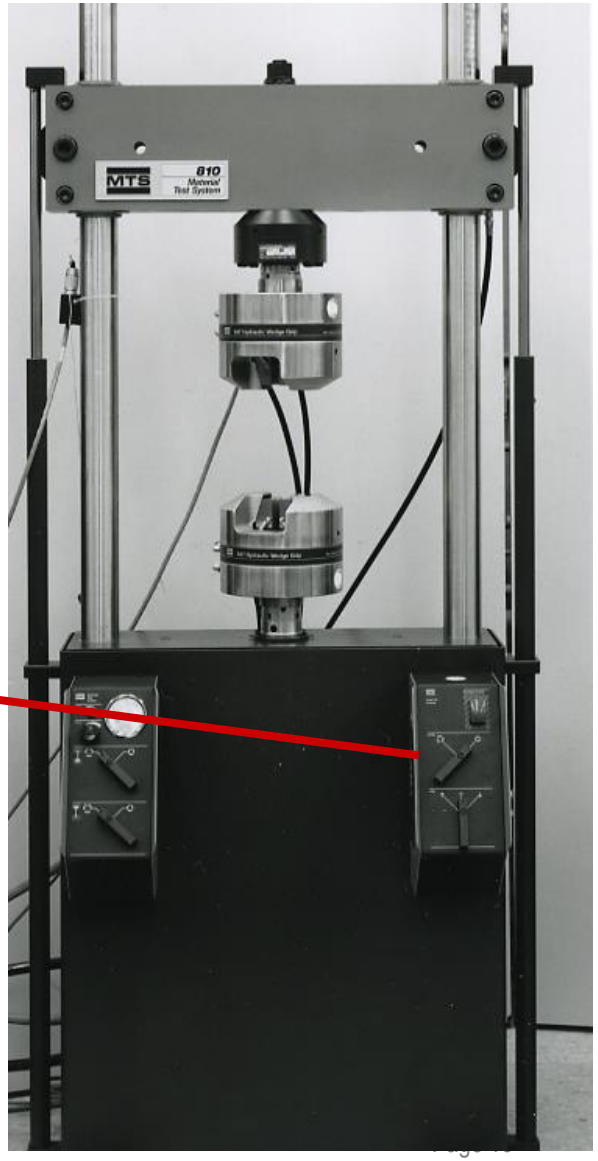
- The 318 load frame uses a 298 manifold.
- The optional filter housing is attached external to the HSM.
- Pressure and return accumulators were standard.
- This manifold also had optional off/low/high pressure control.



Model 298.12 Actuator Manifold

318 Load Frame – Hydraulic Locks

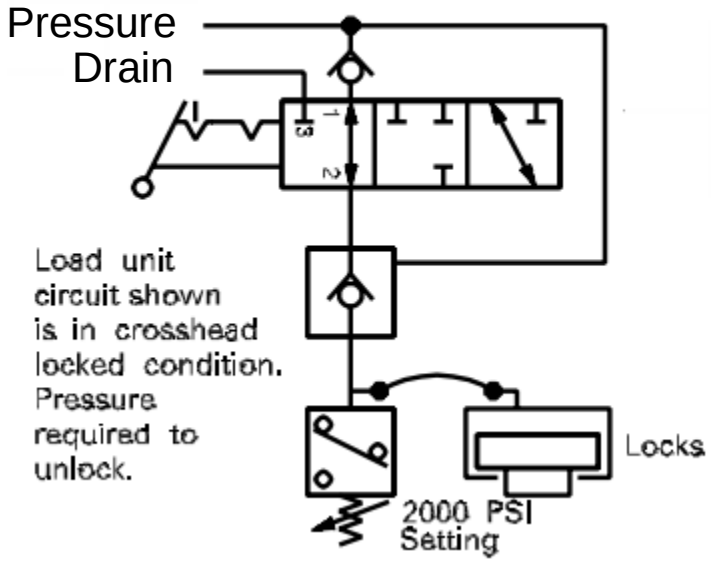
» A hydraulic valve applies and releases pressure to the hydraulic lock cylinders.



318 Load Frame – Hydraulic Locks

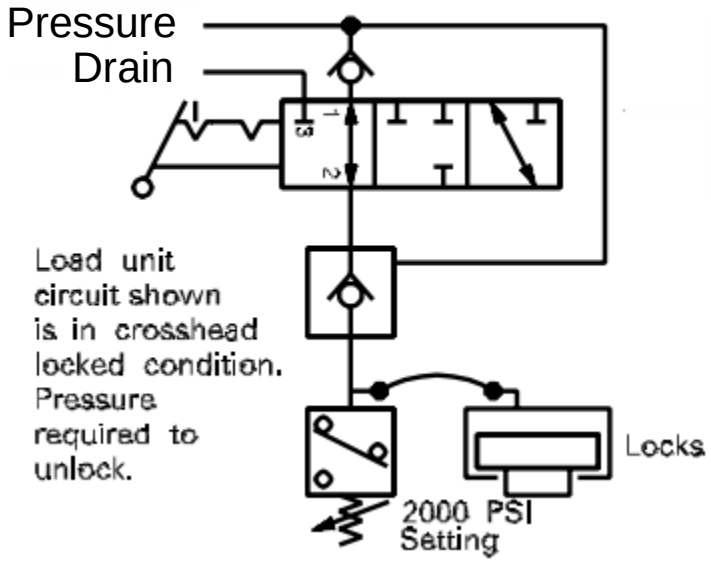
» The hydraulic valve controls a pilot operated check valve

- When in the lock position HPU pressure is applied to the hydraulic lock cylinders
- Hydraulic pressure is required to open the check valve to unlock the crosshead
- When the HPU is off the check valve maintains pressure in the hydraulic lock cylinders



318 Load Frame – Hydraulic Locks

- A pressure switch measures the pressure applied to the hydraulic lock cylinders and is used to detect the actual lock / unlock condition.
  - Switch closes at 2000 PSI
- Default controller configuration is to generate a program interlock when the crosshead is unlocked.
  - This stops the program that is running and leaves hydraulics on

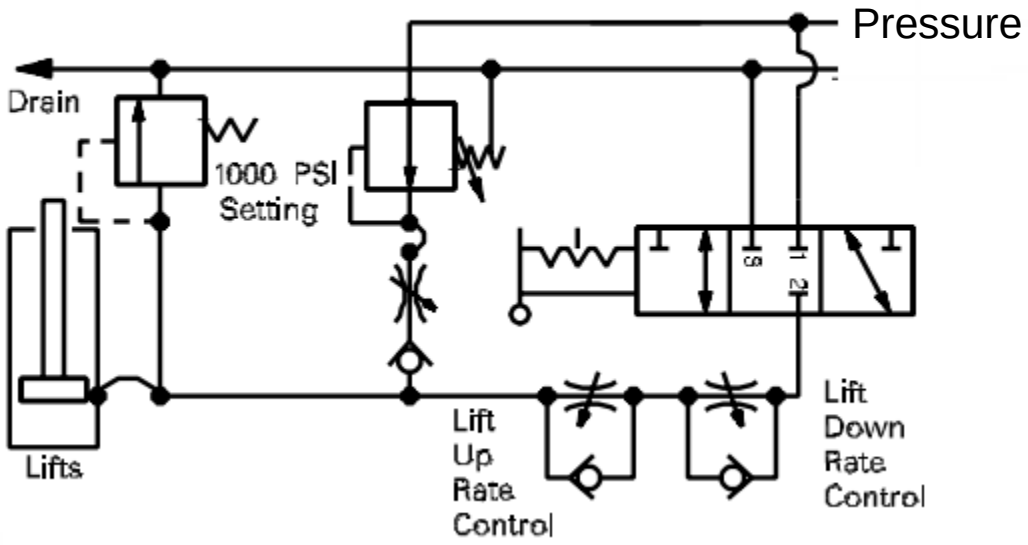


318 Load Frame – Hydraulic Lifts

- The hydraulic lifts are controlled by a single hydraulic up / down valve
- The crosshead is lowered by gravity. The down valve position opens the lift cylinders to the drain line.

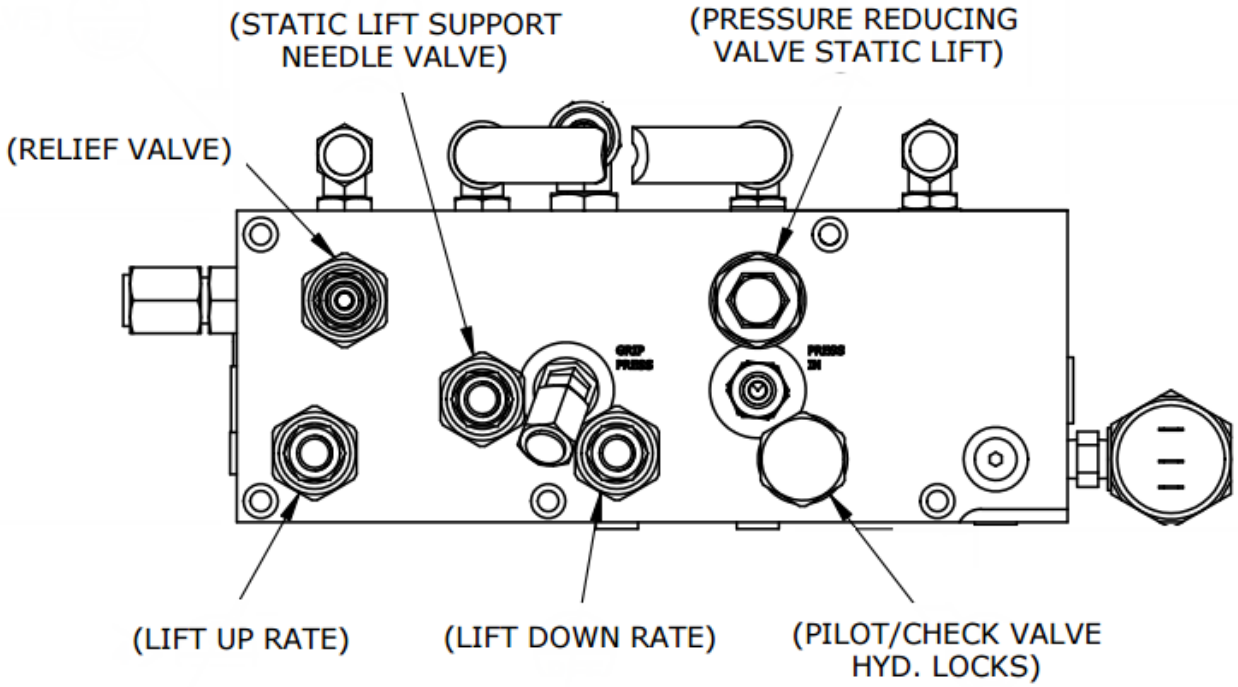
318 Load Frame – Hydraulic Lifts

- The pressure relief valve is factory adjusted to 1000 PSI.
- The pressure reducing valve is adjusted to a pressure slightly less than what is required to lift the crosshead. This then passes through the static support needle valve to provide make up oil to prevent air in the lift cylinder.



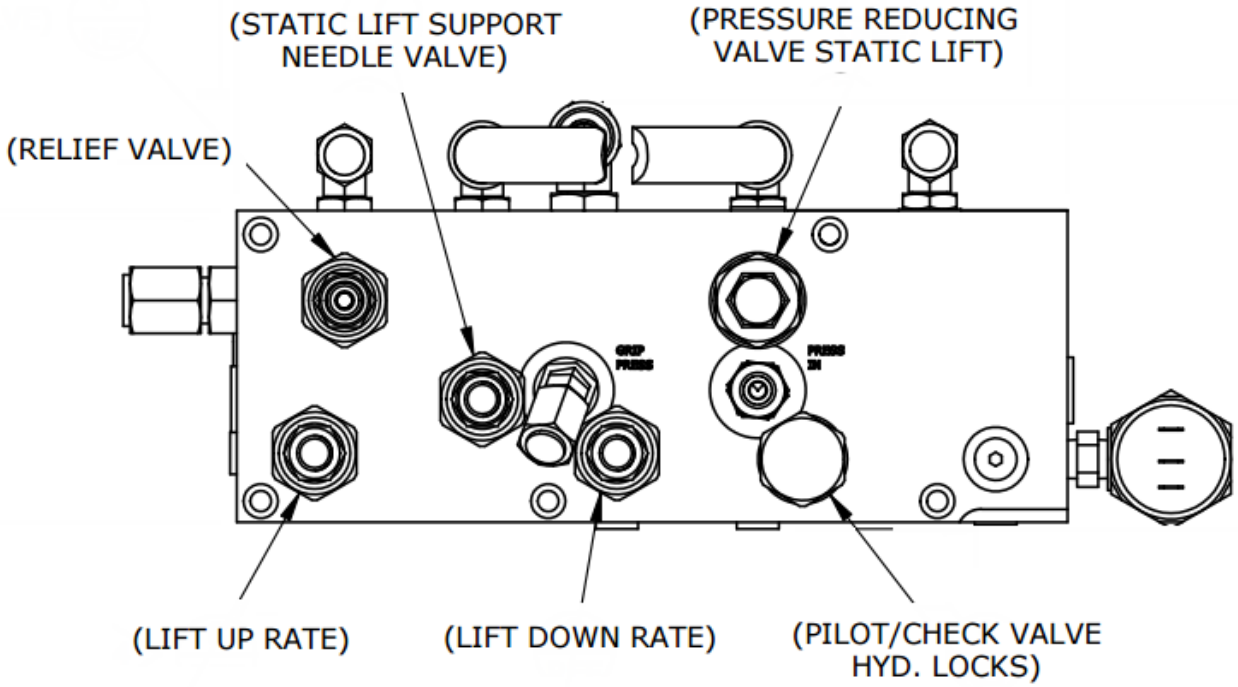
318 Load Frame – Hydraulic Lifts Adjustment

- Ensure lift Up/Down valve is in center position. Unlock the crosshead.
- Open static support needle valve ½ turn
  - Large capacity load frames may require the valve be opened an additional 1/8 turn.
  - Caution: Crosshead will not move downward if this valve is open to far.



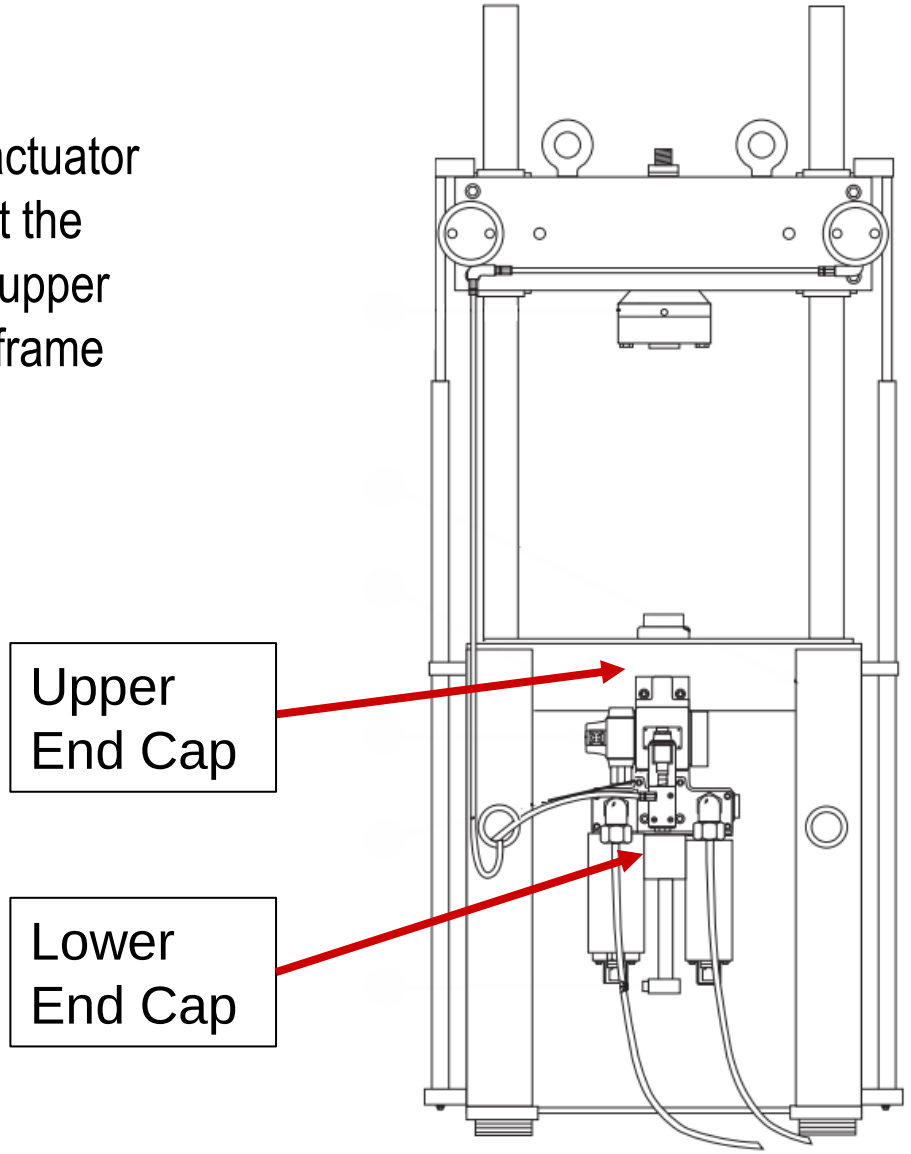
318 Load Frame – Hydraulic Lifts Adjustment

- Turn pressure reducing valve clockwise to increase pressure until the crosshead starts to move upward. Then turn counterclockwise to the point where upward movement stops. Lock the jam nut on the pressure reducing valve.
- Move lift to control to the upward position and adjust the up rate needle valve to achieve a rate of 60-100 inch / min. Repeat for down direction.



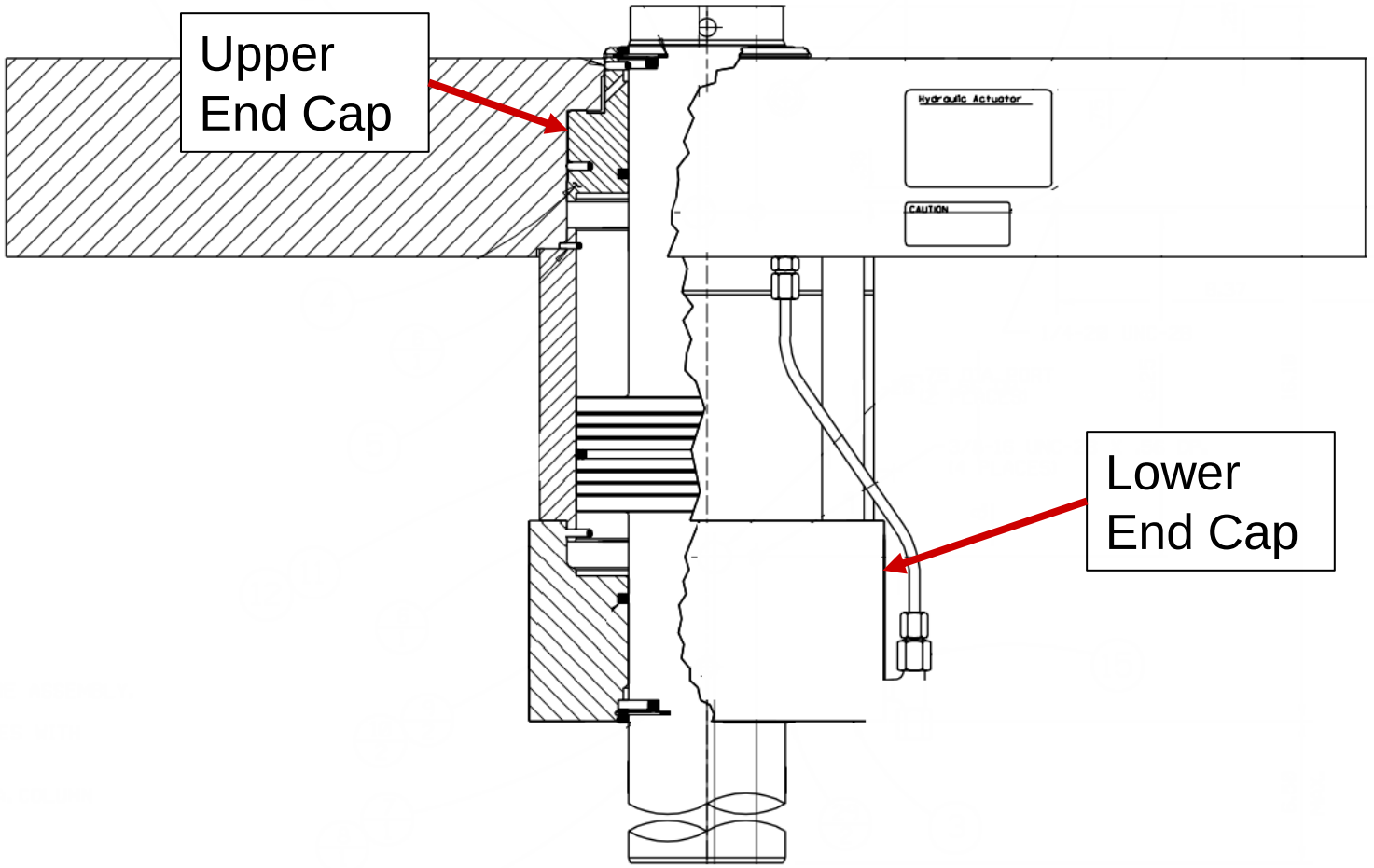
318 Load Frame - Actuator

- The 318 load frame uses a 244 actuator however the upper end cap is not the same as the lower end cap. The upper end cap is inserted into the load frame table / platen.



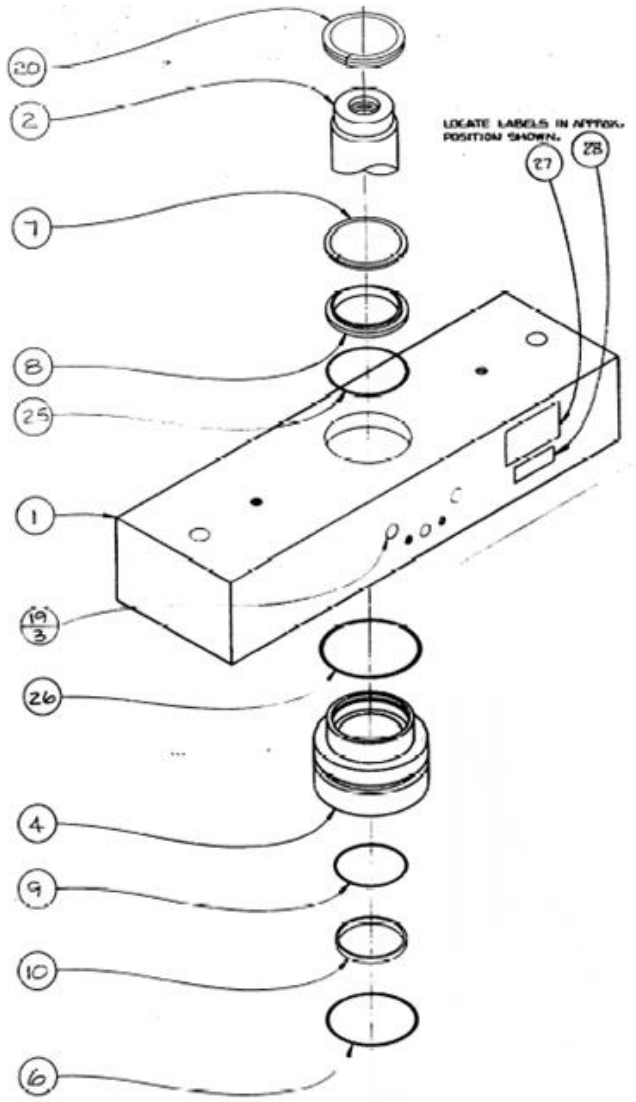
318 Load Frame - Actuator

- The upper end cap is a cylindrical insert which contains the bearing and seals.
- The drain from the upper end cap is internally ported to a tube connection to the lower end cap.



318 Load Frame – Upper End Cap

- The upper end cap contains both seals for the actuator piston rod and O-rings to seal the end cap to platen interface.
- During maintenance when reinstalling the upper end cap ensure that the C1 port in the end cap aligns with the port in the platen to allow oil from the manifold to flow to the actuator.

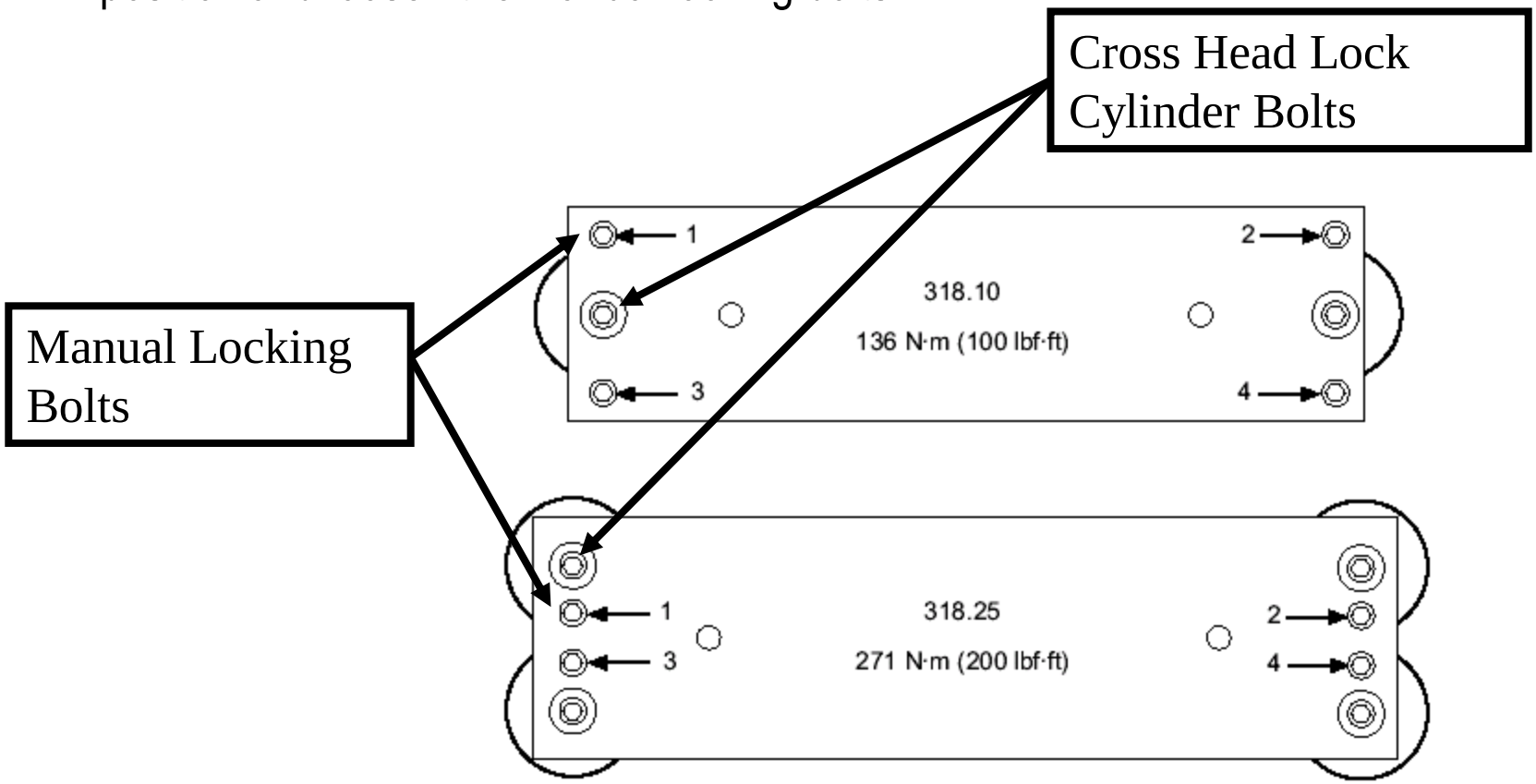


Installation

- After customer has positioned load frame
  - Ensure isolation pads / air bags are in place and air bags if present are properly inflated
    - Refer to appropriate product manual / drawing for air bag inflation procedure
  - Connect Cables
    - HSM
    - Low Flow power supply if present
    - Transducers
  - Connect Hoses
  - Install Grips and connect grip hoses
  - Verify operation

318 Load Frame - Installation

» The crosshead manual lock bolts are tightened prior to shipping. Once hydraulic power is applied to the load frame ensure the hydraulic locks are in the locked position and loosen the manual locking bolts.



Routine Maintenance

- A Routine Maintenance chart is available in each product manual.
  - Perform recommended maintenance according to checklist
- See the Servohydraulic load frame Routine Maintenance video for additional details.

Routine Maintenance Overview Checklist

Recommended service to be performed at each running time interval noted

Calendar Time using 8 hour Running Time Rate Per Day	Daily	Weekly	Biweekly				Annually
Running Time-Hours	8	40	80	500	1000	1,500	2,000
Ensure the actuator platen area is clean.	X [4]						
Check all filter indicators.	X						
Ensure all hose, cables, and connectors are attached properly.		X					
Ensure that the crosshead, lifts, and supports are in working order.		X					